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ABSTRACT

This paper considers issues relating to the measurement of skill for national statistical purposes. It draws upon the work program and research underlying the revision of the national occupational classification for the United Kingdom (UK), SOC90 (Standard Occupational Classification introduced in 1990). The report's introduction states the intention to reflect upon the review-related research findings; detail the perceived inadequacies of SOC90; describe the problems associated with occupational definition in certain areas; show how the revised classification will affect the analysis of skill change; and cause experts to rethink the forecasts of occupational change. Section 2 presents an overview of the history of occupational classification in the UK. Section 3 describes the conceptual basis of the SOC. Section 4 details the perceived weaknesses in SOC90 and the constraints surrounding the development work undertaken to revise this classification. Section 5 outlines some key processes that were influential in bringing about a redefinition of occupations for statistical purposes. Section 6 discusses the resources that were used to investigate the processes of occupational change from a statistical and definitional perspective. Section 7 examines the revised classification in terms of its ability to distinguish and discriminate between occupations and the new analytical opportunities it will provide. Section 8 concludes that SOC2000 (published in spring 2000) makes better use of its conceptual base, solves problems inadequately dealt with earlier, and provides a better tool for job matching purposes than did SOC90. (YLB)

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ED 456 223

Skills Task Force
Research Paper 19

SOC 2000

Redefining Skill
Revision of the Standard
Occupational Classification

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Skills Task Force Research Group

Foreword

The Secretary of State for Education and Employment established the Skills Task Force to assist him in developing a National Skills Agenda. The Task Force has been asked to provide advice on the nature, extent and pattern of skill needs and shortages (together with associated recruitment difficulties), how these are likely to change in the future and what can be done to ease such problems. The Task Force is due to present its final report in Spring 2000.

The Task Force has taken several initiatives to provide evidence which can inform its deliberations on these issues. This has included commissioning a substantial programme of new research, holding consultation events, inviting presentations to the Task Force and setting up an academic group comprising leading academics and researchers in the field of labour market studies. Members of this group were commissioned to produce papers which review and evaluate the existing literature in a number of skills-related areas. The papers were peer-reviewed by the whole group before being considered by members of the Task Force, and others, at appropriate events.

This paper is one of the series which have been commissioned. The Task Force welcomes the paper as a useful contribution to the evidence which it has been possible to consider and is pleased to publish it as part of its overall commitment to making evidence widely available.

However, it should be noted that the views expressed and any recommendations made within the paper are those of the individual authors only. Publication does not necessarily mean that either the Skills Task Force or DfEE endorse the views expressed.

Acknowledgements

This paper draws upon material and information gathered from a wide variety of sources. We are grateful to all those who have helped to compile and analyse these data. Particular thanks are given to the staff of the Occupation Information Unit at the Office for National Statistics, under the leadership of Tessa Staples, for all their hard work in the process of revising the Standard Occupational Classification. We would also like to thank all members of the interdepartmental steering group, which oversaw our work and gave much help and guidance. Additionally, Employment Service staff gave generously of their time to help us with our enquiries.

1. Introduction

This paper considers issues relating to the measurement of skill for national statistical purposes. It draws upon the work programme and research underlying the revision of the national occupational classification for the UK, SOC90[1]. The revised classification (SOC2000) is now virtually complete and its description is due to be published in the Spring of 2000. The paper reflects upon the research findings from the two-year work programme for revision of the classification, detailing the perceived inadequacies of SOC90 and describing the problems associated with occupational definition in certain areas. In so doing, we address some of the issues confronted by the Skills Task Force as it seeks to provide advice on skill needs in the UK economy, particularly in terms of the measurement of skill and the monitoring of change (Skills Task Force, 1999). In addition to informing debate in this area, we show how the revised classification will impact upon the analysis of skill change and cause us to rethink our forecasts of occupational structure.

The plan of the paper is as follows. Section 2 presents a brief overview of the history of occupational classification in the UK. Section 3 describes the conceptual basis of the Standard Occupational Classification. Section 4 details the perceived weaknesses in SOC90 and the constraints surrounding the development work undertaken to revise this classification. Section 5 outlines some of the key processes that were influential in bringing about a redefinition of occupations for statistical purposes. Section 6 discusses the resources that were utilised to investigate the processes of occupational change from a statistical and definitional perspective. Section 7 examines the revised classification in terms of its ability to distinguish and discriminate between occupations and the new analytical opportunities it will provide. Section 8 concludes the paper.

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1 SOC90 is the abbreviation for the current version of the Standard Occupational Classification, introduced in 1990. The revised classification will replace it from 2000 onwards as it is introduced into various national statistical sources. It will be referred to as SOC2000.

2. A brief history of occupational classification in the UK

While it now seems unremarkable that we classify occupations from virtually all national statistical sources via a single standard, this situation has only been achieved in the UK during the last decade. Prior to 1991 the UK, in common with some other countries (e.g. USA, France), had two main occupational classifications. One of these was detailed and extensive, defining over 3,500 occupational areas. This classification, introduced in 1972, was known as the Classification of Occupations and Directory of Occupational Titles (CODOT). Used primarily by the Employment Service (ES), the classification enabled ES staff to classify job vacancies and code the occupations sought by job seekers for job matching purposes. The national statistical office (the Office for National Statistics, formerly the Office of Population Censuses and Survey) used a second, less detailed classification for census and survey purposes. The antecedents of this classification can be traced back to the 1950s, with each version being revised immediately prior to the decennial Census of Population. With the introduction of the 1980 Classification of Occupations (CO80) an attempt was made to integrate its structure with CODOT. The failure of this exercise highlighted the problems of managing two occupational classifications for differing purposes.

In 1986 work commenced to review CODOT. Simultaneously the national statistical office was commencing its plan to revise CO80 in time for the 1991 Census of Population. The Institute for Employment Research (IER) was commissioned to undertake both tasks and immediately proposed to replace both classifications with one national standard, to be known as SOC90. The new common standard would have a life of ten years, after which time it would be subject to review. It is from this review that the material for this paper is drawn.

Measured in terms of the extent to which the producers of statistical information have adopted it in Britain's decentralised statistical system, SOC90 has been a success. It is now applied not just to the population census and all national survey data sources, but it is used as one of the primary mechanisms for matching job-seekers with information on job vacancies held by the Employment Service. It is also used to record occupational details in administrative systems associated with education and training, in health and safety records, morbidity statistics and in births and deaths registration.

There have been significant information gains resulting from standardisation. Statistical users and analysts can match and combine data on occupations from a variety of sources. But uniformity and standardisation come at a price. To gain acceptability, the national statistical office had to have a classification that could be made to work with the occupational material collected on census forms. While these forms typically provide space for a job title *and* a brief description of the main tasks, it is inevitable that a significant number of census form-fillers use vague or broadly

defined descriptions of their jobs[2]. On the other hand, the Employment Service often required occupational detail for job matching purposes and was in a position to collect more detailed information. However, the problem of maintaining a classification consisting of over 3,500 category descriptions was beyond the resources of the ES. Standardisation was achieved, therefore, by abandoning the detailed classification used primarily for job matching purposes. SOC90 also faced another difficult hurdle before it could gain acceptance. While the new classification could embrace changes in occupational structure by defining new occupational areas, the ability to monitor change over time (particularly the inter-censal comparisons of change) would be weakened if the new classification departed radically from its predecessor. The requirement for continuity with CO80 placed a heavy constraint on the definition of SOC90.

3. The conceptual basis of the Standard Occupational Classification

This section describes the organising principles that underlie the construction of SOC90 and SOC2000.

In line with the International Standard Classification of Occupations, ISCO-88[3], the structure of the SOC is based on two main concepts; the concept of the kind of work performed or *job* and the concept of *skill*. Of these two concepts, that of a 'job' is well recognised. Defined as a set of tasks or duties to be carried out by one person, the notion of a job represents a basic element in the employment relationship. Jobs are usually structured by employers (or by the worker in the case of self-employment) and others, including professional bodies, employer and/or worker organisations and governments, may regulate their definition. The concept of skill is widely used, but it not defined or regulated in a consistent fashion. For classification purposes, skill is defined as the ability to carry out the tasks and duties of a job in a competent, thorough and efficient manner. Two aspects of this definition of skill are distinguished in the SOC: *skill level* is defined in terms of complexity of the tasks and duties to be performed; *skill specialisation* is defined as the field of knowledge required for competent, thorough and efficient conduct of the tasks. Within the SOC, as in ISCO-88, four skill levels are broadly defined. Given that skill is related to the complexity of the tasks and duties to be performed, skill levels are linked to the length of time deemed necessary for a person to become fully competent in the performance of the tasks associated with a job. This, in turn, is a function of the time taken to gain necessary formal qualifications or the required amount of work-based training. Apart from formal training and qualifications, some tasks require varying types of experience, possibly in other tasks, for competence to be acquired.

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2 Examples include the job title 'Clerk' and the description of main tasks as 'clerical duties' or 'Machinist' and 'operate a machine'.

3 For details, see ILO (1990).

Within the broad structure of the classification (major groups and sub-major groups)[4] reference can be made to these four skill levels. The first skill level equates with the competence associated with a general education, usually acquired by the time a person completes his/her compulsory education and is signalled via a satisfactory set of school-leaving examination grades. Competent performance of jobs classified at this level will also involve knowledge of appropriate health and safety regulations and may require short periods of work-related training. The second skill level covers a large group of occupations, all of which require the knowledge provided via a good general education as for occupations at the first skill level, but which typically have a longer period of work-related training or work experience. Occupations classified at this level including machine operation, driving, caring occupations, retailing, and clerical and secretarial occupations.

The third skill level applies to occupations that normally require a body of knowledge associated with a period of post-compulsory education but not to degree level. A number of technical occupations fall into this category, as do a variety of trades occupations and proprietors of small businesses. In the latter case, educational qualifications at sub-degree level or a lengthy period of vocational training may not be a necessary prerequisite for competent performance of tasks, but a significant period of work experience is typical. The fourth skill level relates to what are termed 'professional' occupations and managerial positions in corporate enterprises or national/local government. Occupations at this level normally require a degree or equivalent period of relevant work experience.

Table 1 lists the 22 sub-major groups of SOC90 and the 25 sub-major groups of SOC2000 by skill levels. As will become evident, there is no one-to-one relationship between the two classifications at this level, but a reasonable degree of correspondence is indicated by the relative positioning of sub-major groups in each classification within this table.

As can be seen from the names of these sub-major groups, the skill specialisation criterion has been used to distinguish groups of occupations within each skill level. Thus, for example, health professionals are distinguished from science and technology professionals and skilled metal and electrical trades from skilled construction and building trades.

It should be stressed that while the conceptual basis of the classification offers a set of guiding principles for the construction or revision of a classification, there will inevitably be difficulties in making these concepts operational. Some jobs utilise job titles that span a range of skill levels, for example in many clerical occupations. Where there is scope to identify such jobs separately, classification can take place to appropriately defined groups in the classification. But where the same job title

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[4] In common with the international standard, SOC90 and S0C2000 utilise four hierarchical levels within the classification. These are termed major groups, sub-major groups, minor groups and unit groups. In SOC2000, as in ISCO-88, these are represented numerically by one, two, three or four digits.

applies across a range of skill levels, a decision must be made about where to position such jobs.

Table 1 Skill levels and the sub-major group structure of SOC2000 and SOC90

Skill level		Sub-major groups of:	
		SOC2000	SOC90
Level 4	11	Corporate managers	1a Corporate managers
	21	Science and technology professionals	2a Science and engineering professionals
	22	Health professionals	2b Health professionals
	23	Teaching and research professionals	2c Teaching professionals
	24	Business and public service professionals	2d Other professional occupations
			7a Buyers, brokers and sales representatives
Level 3	12	Managers/proprietors in agriculture and services	1b Mangers/proprietors in agriculture and services
	31	Science and technology associate professionals	3a Science and engineering associate professionals
	32	Health and social welfare associate professionals	3b Health associate professionals
	33	Protective service occupations	6a Protective service occupations
	34	Culture, media and sports occupations	3c Other associate professional occupations
	35	Business and public service associate professionals	
	51	Skilled agricultural trades	9a Other occupations in agriculture, forestry and fishing
	52	Skilled metal and electrical trades	5b Skilled engineering trades
	53	Skilled construction and building trades	5a Skilled construction trades
	54	Textiles, printing and other skilled trades	5c Other skilled trades
Level 2	41	Administrative and clerical occupations	4a Clerical occupations
	42	Secretarial and related occupations	4b Secretarial occupations
	61	Caring personal service occupations	6b Personal service occupations
	62	Leisure and other personal service occupations	
	71	Sales occupations	7b Other sales occupations
	72	Customer service occupations	
	81	Process, plant and routine operatives	8a Industrial plant and machinery operatives, assemblers
	82	Transport and mobile machine operatives	8b Drivers and mobile machine operatives
Level 1	91	Elementary occupations: trades, plant and storage related	9b Other elementary occupations
	92	Elementary occupations: clerical and services related	

Note: Sub-major groups of SOC90 have been listed in the order which best approximates their equivalent position in SOC2000. It must be stressed however that there is no exact correspondence at this level.

With the exception of sub-major group 12 *Managers/proprietors in agriculture and services*, the sub-major groups of SOC2000 can be aligned more closely with these four skill levels than was the case with SOC90. This arises because we have attempted to make the aggregate structure of the new classification more hierarchical with respect to skill levels. This was clearly not the case with SOC90, where the group now defined as *skilled agricultural trades* was found in major group 9 and a group of high level sales occupations was allocated within major group 7. The major group structure of SOC90 was more heterogeneous with respect to skill levels, making difficult the interpretation of occupational information classified by SOC90 major groups.

It can be seen from Table 1 that we place major group 5 of SOC2000 *Skilled Trades Occupations* at the third skill level, yet major group 4 *Administrative, Clerical and Secretarial Occupations* is at the second skill level. In an hierarchical classification the numbers of these major groups would be reversed. We have not reordered the major groups in this way for reasons of consistency with SOC90 major groups. We must stress also that the concept of skill level is difficult to apply in certain occupational areas, particularly in clerical and secretarial occupations.

4. Problems with SOC90: opportunities and constraints

As SOC90 was being finalised, a number of key decisions were made which had repercussions for the timing and method of its revision. Firstly, it was recognised that insufficient resources had previously been made available for maintenance of the occupational classification. In order to rectify this situation, responsibility for maintenance was passed to the national statistical office[5] (then known as the Office for Population Censuses and Surveys). To achieve this the Occupation Information Unit (OIU) was formed to monitor implementation of SOC90, respond to user queries and to collect and prepare information relevant to its revision. As part of its work programme a new index to SOC90 was published in 1996. Secondly, a ten year lifetime was agreed for the classification. With this in mind, the OIU began to consult with users of occupational information in 1996 regarding the nature of the revision. Via a survey and by convening meetings of users, a numbers of deficiencies within SOC90 were identified. These were:

- users found it difficult to classify 'new' job titles to SOC90. The conceptual principles of the classification were unclear, leading to ambiguities in the positioning of new job titles within the structure of SOC90;

- the Employment Service was particularly hampered by the broad nature of certain occupational categories. Job seekers often had quite well-defined preferences for particular jobs and had difficulties matching these requirements to vacancy information;

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5 Previously the question of which government agency had responsibility for occupational classification was obscured by the fact that there were two major occupational classifications and no national statistical office.

- certain occupational areas were developing rapidly, but were not well-defined in SOC90. These included information technology occupations, customer service jobs, conservation and environment-related occupations and a wide range of jobs in what can loosely be termed 'caring' occupations.

Other pressures to revise SOC90 were arising elsewhere. Two of these have been particularly important in the revision process. In 1992 the Statistical Office of the European Communities (Eurostat) commenced a programme of work to harmonise national occupational classifications across the European Union. This was achieved by mapping national statistical classifications to an agreed implementation of the international standard classification, know as ISCO 88(COM). Subsequently, countries submitted Labour Force Survey and Population Census data to Eurostat classified to this common standard. Detailed statistical analysis of these data showed that, for the UK, there appeared to exist a severe definitional problem with the category termed *Corporate managers (Elias, 1996).* Defined as the managers of organisations and enterprises with 10 employees or more, the UK had virtually three times the EU average percentage of its workforce classified to this category. While some variation in occupational structure between EU countries is to be expected, a difference of this scale was indicative of a significant classification problem.

The second source of pressure to reform the SOC90 arose from the ESRC/ONS *Review of Social Classifications.* Social classifications[6] have been in use in the UK for a long period, but had developed in a haphazard and rather unscientific manner. Starting in 1997, the *Review* proposed a new conceptual basis for social classification and undertook a major analytical research programme leading to the development of a new social classification based upon SOC90[7]. Although the concept of 'skill' does not feature in this classification, the associated research and development work put the structure of SOC90 under the microscope and revealed a number of classification issues that would be addressed in its revision[8].

Two major constraints regulated the scale of the revision of SOC90. First, users were keen to retain as much continuity with SOC90 as possible. Whilst recognising that the inadequacies of SOC90 and the rapid changes in the structure of jobs would inevitably mean that the new classification would create a statistical break in time-series indicators of occupational structure, this desire for continuity translated into a requirement that the conceptual basis of the classification should not be changed, nor should its major group structure be altered. A second constraint derived from the need to improve alignment with the International Standard Classification of Occupations, itself not due for revision before 2008. Besides these strictures, a more practical consideration acted as a significant constraint on the revision process

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6 The two main social classifications in the UK are Social Class and Socio-economic groups.

7 See Rose and O'Reilly (1998).

8 A consequence of this process is that the new National Statistics Socio-economic Classification will need to be rebased on SOC2000. This work is in hand and will be completed during 2000.

- the limited resources available for revision. Earlier classifications had consumed significant resources in terms of time and money[9]. Efficiency gains through access to large computerised databases could be used to offset this comparative reduction in resources. It remained, however, a daunting task to revise a national classification from start to finish within two years.

5. Processes of occupational change

This section discusses briefly the major processes of labour market change which both inform and shape the nature of the revision to SOC90. Given that the Standard Occupational Classification is defined in terms of *skill* and *type of work*, we consider here those forces which have brought about a redefinition of skills (changes in the nature of skills demanded by employers, and skill supplied by employees) and the reorganisation of work. Much of the evidence we draw upon derives from research on the processes of changes. The evidence is limited, because we must move beneath occupational statistics to uncover the way in which they are masked by the classification. With the exception of detailed qualitative case studies, this reflects the fact that the SOC is the main statistical tool for the measurement of skill. As such, the measurement of change is limited by the classification and can do no more than express skill change in terms of its constituent categories.

The major influences on occupational structure are related to a number of factors, including the impacts of technological change, changes in the tastes and preferences of consumers. We define technological change here as developments in the capital infrastructure that facilitate the production of new goods and services, or more efficient production and delivery methods for existing goods and services. Here we recognise the importance of information technology and microprocessor control as the main forces that have contributed to the redefinition of skills and the reorganisation of work. Changes in the tastes and preferences of consumers have been better catered for through technological innovation, but part of these changes derive also from a growth in the demand for quality, reliability and dependability in goods and services consumed.

For a variety of reasons (increased income, increased competition or a growing awareness of better quality standards available in other countries) consumers now express demands for higher quality goods and services, possibly backed by customer support services. These demands, in turn, have repercussions in terms of the organisation of work and the structure of skills. Additionally, the increasing scale of global competition undoubtedly plays a role in shaping the organisation of work and the redefinition of skills, but such changes are more likely to influence the speed of skill biased technological change than to work as independent influences on skill definition. For example, the virtual eradication of jobs related to textile production in the UK probably derives not just from changes in trade agreements, but also to the

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[9] CODOT was preceded by a six year programme of data collection and research. SOC90 took 4 years to develop. SOC2000 had to be completed within 2 years.

better flow of information which facilitates a modular approach to design, ordering and production outside the UK to take advantage of lower labour costs.

In addition to these factors, changes have accelerated on the supply side of the labour market. Higher education has extended over the last decade from a situation where one in eight of young people pursued a higher education[10] to more than one in three. While there exists no direct evidence of the growing 'professionalisation' of work, change on such a scale permits both employers and employees to redefine work into more complex 'packages'. As an example, in some organisations, the title 'executive assistant' has replaced 'personal assistant'. This is a job which was essentially clerical in nature but which now presumes that the incumbent will display initiative, make efficient use of information technology and possible move on to a more traditional managerial position at some later stage. In health care, some nursing occupations are now defined in terms of a requisite university level education. These changes could not have taken place in the absence of a supply of suitably qualified persons and may well have been consequential upon such availability.

Reviewing these factors, Green *et al.* (1999) examine the correlates of a composite skill index, constructed from information on qualifications required for competent performance of a job, training time and learning time[11]. Over the period 1986 to 1997, a strong relationship was found between the extent to which computers were used in particular jobs and their composite skill index. Other significant positive associations noted by the authors of this study relate to the increased use of quality control procedures. While this evidence can not indicate with precision *where* such changes are occurring within the occupational spectrum, the general finding lends strong support to the view that technological changes are the prime source of skill changes and confirms our suspicions that skill changes are not necessarily recorded as occupational change via the existing classification.

From consideration of factors such as these, we focused our work on the development of SOC2000 in a number of areas. These were:

Computing and related occupations
Whilst nearly all jobs have been affected in some way by the rapid progress in information and communication technologies, at the forefront of these are the jobs which relate directly to the design and implementation of such technologies. It seemed crucial that this area of classification should be overhauled thoroughly.

Managerial occupations
For a variety of reasons, we suspected that this area of occupational classification was in need of reform. The apparent inconsistency in definition

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10 Typically a university degree or equivalent from ages 18 to 21.

11 Training time is defined in this study as the amount of training received by a respondent for the type of work they were doing and learning time as the length of time they took to become competent.

of managerial occupations compared with our EU partners was reason enough for this decision. However, other strands of research evidence pointed to forces such as 'delayering' of management structures in organisations and to a potential 'inflation' of skill definition through the use of the title 'manager' in jobs which we would not regard as managerial[12].

Conservation/environmental occupations
This is an area where shifting tastes and preferences have led to an increasing demand for environmental protection and conservation. SOC90 did not recognise many specific occupations related to these activities within its structure. During consultations undertaken in the development process, a number of users had expressed particular concern over this apparent omission.

Skill upgrading/deskilling within manufacturing processes
Two sets of forces appear to underlie change in occupations associated primarily with the manufacturing process. The continued development of manufacturing systems and the associated move away from mass production to small batch, customised production may have stimulated the demand for technically qualified occupations in production. Simultaneously, the widespread use of computerised control methods may have lessened the need for workers in many traditional craft occupations. Such changes are likely to be located in major groups 3, 5, 8 and 9 of SOC90.

Customer service occupations
Shifts in consumer tastes and preferences towards a more 'self-service' approach, associated with the widening availability of competitively-priced goods and services, have stimulated the demand for and supply of after-sales service, quality assurance and customer 'loyalty' schemes to attract and maintain customers. These developments appear to have given rise to a new set of occupations in which the associated tasks lie at the interface between the producers or distributors and the consumers of goods and services.

Remote service provision
Development in information and communication technologies has facilitated the demand for the provision of services outside 'normal' business hours and has stimulated the development of service provision within remote call centres. Part of the growth in demand may be due to latent demand and some may be a function of increased female labour force participation. The latter trend may have resulted in a reduction in the availability of one household member to: shop, complete transactions relating to banking, provision of services related to telephone, electricity, gas, water, etc. during 'normal' business hours. While these changes may yet be superseded by web-based commercial and informational transactions, the rapid growth in this area combined with the

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12 A good example of this is the now frequent use of the title 'train manager' for the job known earlier as 'senior conductor'.

scale of employment change suggested the need for specific occupational categories to identify call centre operators.

6. Investigating occupational change: sources and methods

Sources of information about these processes of occupational change were available to us in a variety of formats. By far the most useful sources were derived from the Census of Population and the Labour Force Survey. While the 1991 Census of Population is now somewhat dated in that it fails to capture changes taking place over the last eight years, such information is valuable in determining how well SOC90 was operationalised and gives useful information on the quality of occupational detail obtained from census form-fillers.

The main source available from the 1991 Census of Population was a ½ % sample of individual records for England and Wales. The text response to questions on occupation, industry and post-schooling qualifications was extracted from approximately 115 thousand census forms and placed into a searchable database. Similar information was extracted from the 1996/97 Labour Force Survey, covering 57 thousand individuals for whom we have details of their job title, main tasks performed in their job, qualifications required for the job and their highest qualification. Other sources of information on occupational descriptions were obtained via the Employment Service, which generated a database of 291 thousand detailed descriptions of job vacancies, all coded to SOC90.

The Employment Service was keen to ensure that its interests in occupational classification for job matching purposes were adequately reflected in the new classification. To this end, the ES commissioned the IER to undertake a thorough review of the process of job matching and the role played by SOC90 in this process. Through a series of visits to Jobcentres and via the collection of relevant information from a survey of approximately 60 Jobcentres, we gained a clear idea of the weaknesses of SOC90. This study confirmed our earlier conclusion, that we should focus the development of SOC2000 in a number of key areas. It also added some new requirements to our list. For example, SOC90 does not distinguish drivers by the category of vehicle that they are licensed to drive. This is, of course, an important distinction to make for job-matching purposes.

Other sources of information, which proved useful in investigating processes of skill change and to illuminate the definition of skill, were:

- the '371 database' – an electronic encyclopaedia of statistical information structured around the 371 unit groups of SOC90 (McKnight and Elias, 1997);

- a database of queries collected over an eight year period from agencies using SOC90 for coding occupational information;

- recently published material containing detailed descriptions of a wide variety of jobs (trade journals, newspaper advertising for job vacancies, careers guidance materials);

- correspondence from interested parties, including trades unions, trade associations, employers, employer associations and government departments.

- information arising from the detail scrutiny of SOC90 unit groups by the team developing the new Social Classification for the UK;

These sources gave much valuable information about the problem areas of the SOC and yielded a 'test-bed' of data for experimentation with the construction of new occupational categories. Particularly valuable in this respect were the Labour Force Survey and the detailed lists of job vacancies from the Employment Service.

In the following sub-sections we give some further information about the way in which we used some of the more quantifiable elements of these information sources to develop the new classification. We must stress here that the general approach we took combined both quantitative and qualitative methods. In particular, a major concern throughout the development work was the extent to which a particular idea could be made operational in the light of the typical information available to those who are engaged in the process of coding occupational information.

6.1 Education as an indicator of skill

One way of looking at the skill requirements within particular occupations is to examine the average level of qualification held by workers within specific occupation groups. This may sound straightforward but in practice is complicated by the fact that there exists a wide range of formal qualifications. These qualifications may have been obtained at school, college, university or on-the-job. To facilitate the comparison a uniform classification of qualifications was developed[13] which assigned the average number of *additional* years of schooling (training) normally required to attain the qualification level post compulsory schooling. For example, it takes two years post-compulsory education to acquire A levels and therefore A levels are assigned a score of two, a first degree scores five, master's degree six, and so on. The average education score can then be computed within specific occupation groups or across a group of occupations. Figure 1 shows the average education score of employees within the SOC90 major groups.

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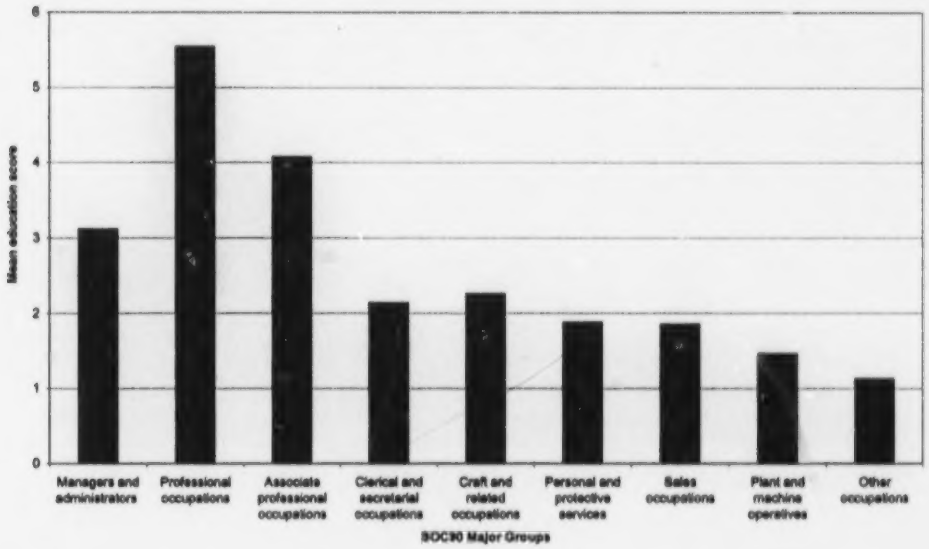
13 This classification was developed to examine education mismatch between individuals leaving JobSeeker's Allowance and the jobs they enter (McKnight, 1999).

Figure 1 Mean education score by SOC90 major groups



Source: Labour Force Surveys

In terms of a qualification hierarchy within SOC90, major group 2 *Professional Occupations* would be at the top as average employees in this major group have 5.5 additional years of education after the age of 16. Major group 2 would be followed by 3, 1, 5, 4, 6, 7, 8 and finally 9. On average employees in SOC90 major group 9 *Other Occupations* have just one additional year of education after the age of 16. While it is interesting to look at the relationship between the major groups the revision has concentrated on looking within the major groups at the unit groups as these average figures can mask a considerable amount of heterogeneity. For example, Figure 2 shows the average education scores in SOC90 unit groups within major group 7 (*Sales Occupations*). While the average education score of employees in major group 7 is consistent with two additional years of education it is immediately apparent that employees in six unit groups at the top of major group 7 have much higher levels of education. These occupation groups contain buyers, importers/exporters, brokers and sales representatives. This information supported by other sources helped in the decision to move these occupations higher up the occupational classification in SOC2000 to Major 3 (*Associate Professional and Technical Occupations*).

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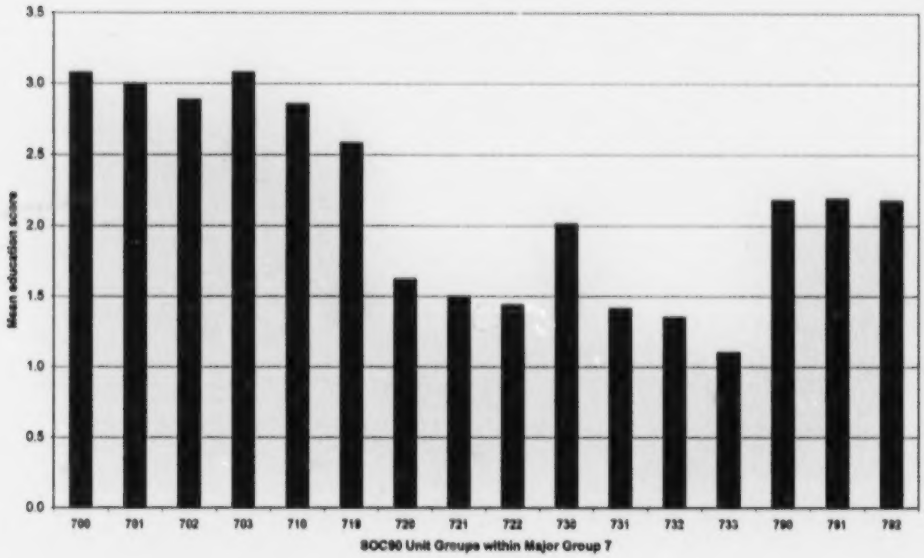
Figure 2 Mean education score by unit groups in SOC90 major group 7 (Sales occupations)



Source: Labour Force Surveys

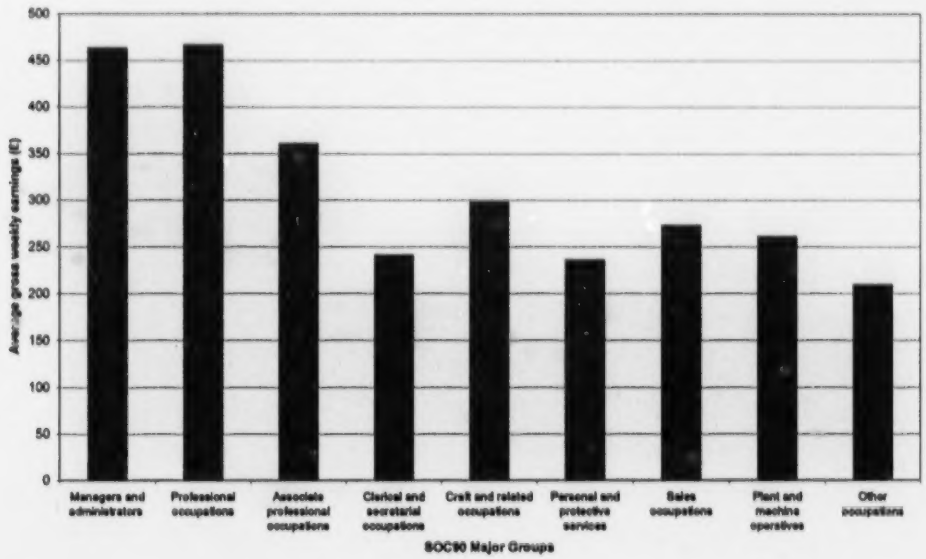
While this information on typical qualifications is useful it is important to be aware of differences between the age cohorts; older workers may have the skills but not the paper qualifications to prove it. Simply ranking occupations according to the level of qualifications held by typical job-holders within the occupation groups will produce some undesirable results. For some occupations an increase in the level of qualifications may be an artefact of the dramatic increase in educational qualifications held by younger age cohorts. If the increase in supply of higher qualified individuals led to a uniform increase in all occupation groups then this would not be a problem. However, as the increase is most marked in the younger age cohorts then occupations with relatively high proportions of young people may appear to qualify for occupation upgrading even if there is no change in the tasks performed. In addition some occupations are known to be popular forms of employment for students such as bar work. This approach of ranking occupations by the qualifications of those who occupy them could, therefore, lead to inappropriate decisions. To reduce the potential for distortion we also looked at education scores for different age cohorts.

6.2 Earnings as an indicator of skill

A second statistical source of information we used was earnings. It is arguable that, to some degree, wages reflect the skill and competencies of individuals. Jobs that require a high level of skill reward individuals, in terms of wages, at a higher level than jobs requiring lower levels of skill.

Figure 3 compares the average level of gross weekly earnings among full-time employees in each of the nine SOC90 major groups. The occupational rankings are very similar to those obtained from the education scores. Two major groups appear to fare better in terms of earnings than qualifications and these are major group 1 (*Managers and Administrators*) and major group 5 (*Craft and Related Occupations*). Both these occupation groups are distinguished by the fact that some employees within them tend to possess skills which are not formally recognised in educational qualifications, i.e. obtained through training and apprenticeship schemes (major group 5) or entrepreneurial, managerial skills and seniority associated with work experience (major group 1).

Figure 3 Average gross weekly earnings of full-time employees by SOC90 major groups

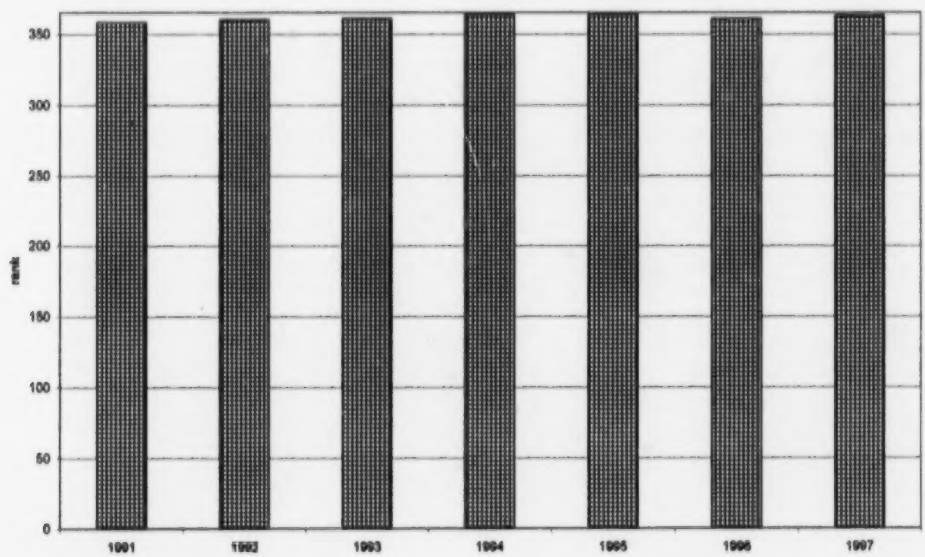


Source: Labour Force Survey, Winter 1996/97

However, earnings cannot be interpreted as a clear indicator of skill as they also reflect the demand for particular skills as well as the supply of those skills in the working population. High earnings can be associated with high skill levels but also (at least in the short term) skill shortages. Consequently, an increase in the supply of qualified individuals without a comparative increase in the demand for individuals with these skills could lead to a fall in the average wages received even though the tasks they perform have not changed with regards to the level of competency required. One way of avoiding the reclassification of occupations due to short run fluctuations in earnings associated with supply and demand is to look at longer run trends in occupational earnings. We used the New Earnings Survey to explore changes in average occupational earnings over the 1990s.

A simple approach involves ranking occupation groups according to average earnings and then tracing the rank over a number of years to identify upward or downward trends. If an occupation group is consistently characterised by a low occupational earnings rank relative to other unit groups within a major group then this unit group is a candidate for repositioning. We have used information on earnings to inform decisions on repositioning unit groups within SOC2000. Figure 4 shows the rank of median occupational earnings in SOC90 unit group 621 (*Waiters, waitresses)* between 1990 and 1997. The occupation unit group with the highest median earnings is assigned a rank of 1 and so on until the unit group with the lowest median earnings is assigned a rank of 371. It is clear from this chart that unit group 621 in SOC90 (*Waiters, waitresses*) has consistently been one of the lowest earning occupation groups, suggesting that its position in major group 6 is inappropriate. This information provided part of the evidence that convinced us that unit group 621 should be positioned with other elementary occupations in SOC2000 major group 9.

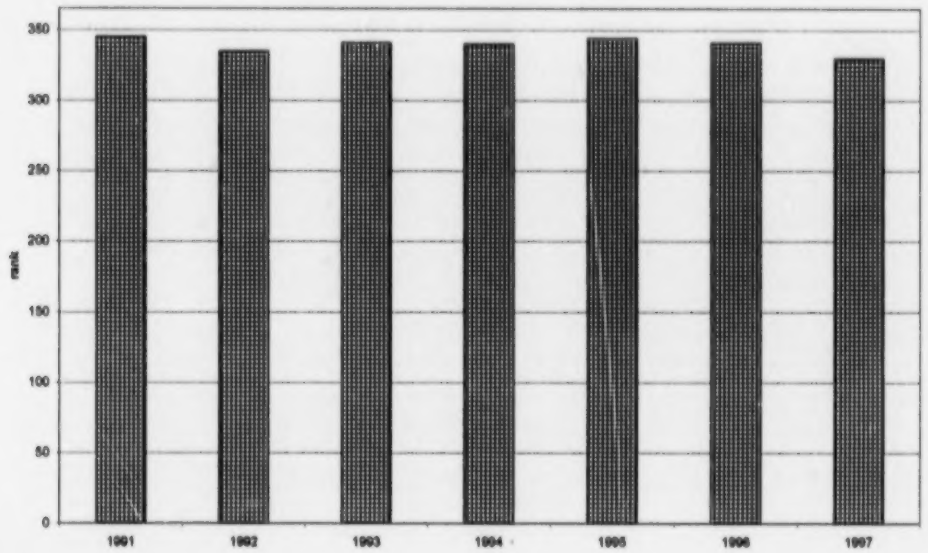
Figure 4 Rank of median earnings, full time employees in SOC90 621 (Waiters, waitresses) between 1991 and 1997



Source: New Earnings Survey

Another candidate for repositioning was SOC90 unit group 349 (*Other health associate professionals n.e.c.).* Figure 5 shows the rankings of median earnings for this unit group between 1991 and 1997. This information formed part of the evidence that led us to reposition SOC90 349 to SOC2000 major group 6.

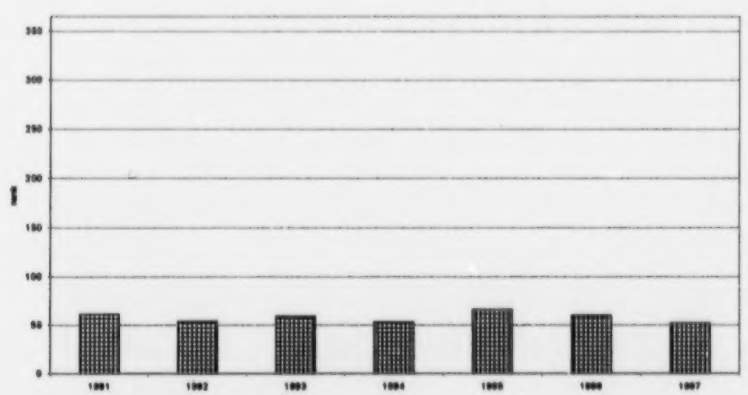
Figure 5 Rank of median earnings, full time employees in SOC90 349 (Other health associate professionals n.e.c.) between 1991 and 1997



Source: New Earnings Survey

In contrast, SOC90 unit group 320 (*Computer analyst/programmers)* was a candidate for repositioning further up the occupation classification. Figure 6 shows the consistently high rankings of the median earnings within this occupation group. Detailed analysis of this unit group resulted in parts of its constituent occupations being repositioned in major group 2 of SOC2000.

Figure 6 Rank of median earnings, full time employees in SOC90 320 (Computer analyst/programmers) between 1991 and 1997



Source: New Earnings Survey

7. An overview of the new structure of SOC2000

This section presents an outline of some of the major changes that will be introduced within SOC2000. Users who require more detail must await publication of the classification in the Spring of 2000. The information set out below is provisional and may be subject to further minor changes as publication plans proceed.

We commence by examining major group 1 (*Managers and senior officials*). The extract from SOC2000 shown below shows the new minor and unit groups which are now included for *Quality and Customer Care Managers*, and in the area of Health and Social services. A new unit group exists for *Natural environment and conservation managers*. In the area of hospitality and leisure services, new unit groups exist for *Conference and exhibition managers, leisure and sports facility managers* and *travel agency managers*. In other service sector areas, *managers and proprietors of small retail establishments* are defined more clearly, and a new unit group exists for *recycling and refuse disposal managers*.

In major group 2 (*Professional occupations*) we show the new unit groups for *Information and communication technology professionals*. *IT strategy and planning professionals* are shown as distinct from *software professionals*. The latter unit group was previously split between major groups 2 and 3. Our research indicates that this was inappropriate. Accordingly, all software and programming occupations, which involve a high level of knowledge of software, networking and the software/hardware interaction, are classified to major group 2. These decisions also reflect advice and guidance we have received from industry training bodies in this area.

Research professionals are now identified according to the type of research they perform. A new unit group exists to capture those occupations in the public service which are essentially administrative in nature, but which require a degree or equivalent level of experience for competent performance.

Selected managerial and professional unit groups in SOC2000

SOC 2000	Title of minor group and associated unit groups
114	**QUALITY AND CUSTOMER CARE MANAGERS**
1141	Quality assurance managers
1142	Customer care managers
118	**HEALTH AND SOCIAL SERVICES MANAGERS**
1181	Hospital and health service managers
1182	Pharmacy managers
1183	Healthcare practice managers
1184	Social services managers
1185	Residential and day care managers
121	**MANAGERS IN FARMING, HORTICULTURE, FORESTRY AND FISHING**
1211	Farm managers
1212	Natural environment and conservation managers
1219	Managers in animal husbandry, forestry and fishing n.e.c.
122	**MANAGERS AND PROPRIETORS IN HOSPITALITY AND LEISURE SERVICES**
1221	Hotel and accommodation managers
1222	Conference and exhibition managers
1223	Restaurant and catering managers
1224	Publicans and managers of licensed premises
1225	Leisure and sports facility managers
1226	Travel agency managers
123	**MANAGERS AND PROPRIETORS IN OTHER SERVICE INDUSTRIES**
1231	Property, housing and land managers
1232	Garage managers and proprietors
1233	Hairdressing and beauty salon managers and proprietors
1234	Managers and proprietors in small retail establishments
1235	Recycling and refuse disposal managers
1239	Managers and proprietors in other services n.e.c.
213	**INFORMATION AND COMMUNICATION TECHNOLOGY PROFESSIONALS**
2131	IT strategy and planning professionals
2132	Software professionals
232	**RESEARCH PROFESSIONALS**
2321	Scientific researchers
2322	Social science researchers
2329	Researchers n.e.c.
244	**PUBLIC SERVICE PROFESSIONALS**
2441	Public service administrative professionals
2442	Social workers
2443	Probation officers
2444	Clergy

In major group 3 we show the new unit groups which have been created to classify *IT service delivery occupations*. These are jobs that involve a technical knowledge of IT operations or provide technical support to users. A new category is shown for *paramedics* and for *medical and dental technicians*. Social welfare associate professionals now distinguish *youth and community workers* separately from *housing and welfare officers*. A separate minor groups is included for *Therapists*, consisting of unit groups for *physiotherapists, occupational therapist, Speech and language therapists* and *therapists not elsewhere classified*.

A significant effort was made to develop a better treatment for a large and growing group of occupations in the arts, literature, media, sports and fitness. Three minor groups and fourteen unit groups are now used to classify occupations in this area. In the area of business and finance, a new structure was introduced, following our decision to move *brokers* from major group 7 to major group 3. New unit groups are included for *conservation associate professional* occupations.

In major group 4 we have repositioned a number of administrative occupations which were previously placed in major group 1. The extract below shows just one of the new minor groups in this area. Others exist for administrative occupation is government and related areas, finance, communications and for general clerical occupations.

In major group 5, farmers have been relocated here. Previously these occupations were placed in major group 9. New occupational areas have been defined in major group 6 for *childcare and related occupations* and for *leisure and travel service occupations*.

In major group 7 we have a new minor group to cover *customer service occupations*.

No details are extracted from major group 8. Our major concern here was to reduce the proliferation of unit groups in this major group, many of which could no longer exist separate definable entities due to the decline in this area of the occupational structure of employment.

Major group 9 now includes a significant number of unit groups that have been repositioned here from other major groups in SOC90. In particular, we draw attention to the new position for *waiters, waitresses* and *bar staff*. A new minor group has been created for what we term *Elementary occupations: security and safety services*.

Selected unit groups in major groups 3 (Associate professionals and technicians), 4 (Administrative, clerical and secretarial occupations), 6 (Personal service occupations), 7 (Sales and customer service occupations) and 9 (Elementary occupations)

SOC 2000	Title of minor group and associated unit groups
313	IT SERVICE DELIVERY OCCUPATIONS
3131	IT operations technicians
3132	IT user support technicians
321	HEALTH ASSOCIATE PROFESSIONALS
3211	Nurses
3212	Midwives
3213	Paramedics
3214	Medical radiographers
3215	Chiropodists
3216	Dispensing opticians
3217	Pharmaceutical dispensers,
3218	Medical and dental technicians
322	THERAPISTS
3221	Physiotherapists
3222	Occupational therapists
3223	Speech and language therapists
3229	Therapists n.e.c.
323	SOCIAL WELFARE ASSOCIATE PROFESSIONALS
3231	Youth and community workers
3232	Housing and welfare officers
341	ARTISTIC AND LITERARY OCCUPATIONS
3411	Artists
3412	Authors, writers
3413	Actors, entertainers
3414	Dancers and choreographers
3415	Musicians
3416	Arts officers, producers and directors
343	MEDIA ASSOCIATE PROFESSIONALS
3431	Journalists, newspaper and periodical editors
3432	Broadcasting associate professionals
3433	Public relations officers
3434	Photographers and audio-visual equipment operators
344	SPORTS AND FITNESS OCCUPATIONS
3441	Sports players
3442	Sports coaches, instructors and officials
3443	Fitness instructors
3449	Sports and fitness occupations n.e.c.
353	BUSINESS AND FINANCE ASSOCIATE PROFESSIONALS

SOC 2000	Title of minor group and associated unit groups
3531	Estimators, valuers and assessors
3532	Brokers
3533	Insurance underwriters
3534	Finance and investment analysts/advisers
3535	Taxation experts
3536	Importers, exporters
3537	Financial and accounting technicians
3539	Business and related associate professionals n.e.c.
355	CONSERVATION ASSOCIATE PROFESSIONALS
3551	Conservation and environmental protection officers
3552	Countryside and park rangers
413	ADMINISTRATIVE/CLERICAL OCCUPATIONS: RECORDS
4131	Filing and other records assistants/clerks
4132	Pensions and insurance clerks
4133	Stock control clerks
4134	Transport and distribution clerks
4135	Library assistants/clerks
4136	Database assistants/clerks
4137	Market research interviewers
612	CHILDCARE AND RELATED PERSONAL SERVICES
6121	Nursery nurses
6122	Childminders and related occupations
6123	Playgroup leaders/assistants
6124	Educational assistants
621	LEISURE AND TRAVEL SERVICE OCCUPATIONS
6211	Sports and leisure assistants
6212	Travel agents
6213	Travel and tour guides
6214	Air travel assistants
6215	Rail travel assistants
6219	Leisure and travel service occupations n.e.c.
721	CUSTOMER SERVICE OCCUPATIONS
7211	Call centre agents/operators
7212	Customer service occupations
921	ELEMENTARY OCCUPATIONS: CLERICAL RELATED
9211	Postal workers, mail sorters, messengers, couriers
9219	Elementary office occupations n.e.c
922	ELEMENTARY OCCUPATIONS: PERSONAL SERVICES RELATED
9221	Hospital porters
9222	Hotel porters
9223	Kitchen and catering assistants
9224	Waiters, waitresses
9225	Bar staff

SOC 2000	Title of minor group and associated unit groups
9226	Leisure and theme park attendants
9229	Elementary personal services occupations n.e.c.
923	ELEMENTARY OCCUPATIONS: CLEANSING SERVICES
9231	Window cleaners
9232	Road sweepers
9233	Cleaners, domestics
9234	Launderers, dry cleaners, pressers
9235	Refuse and salvage occupations
9239	Elementary cleaning occupations n.e.c.
924	ELEMENTARY OCCUPATIONS: SECURITY AND SAFETY SERVICES
9241	Security guards and related occupations
9242	Traffic wardens
9243	School crossing patrol attendants
9244	School mid-day assistants
9245	Car park attendants
9249	Elementary security and safety occupations n.e.c.

To gain some indication of the potential impact of these and a wide variety of other changes, the Occupation Information Unit has reclassified the ½% sample of the Census of Population for England and Wales which was originally coded to SOC90. While this is a guide to the potential impact of SOC2000 in terms of the measurement of occupational structure, these comparisons must be treated with a degree of caution. The most obvious point to make is that the Census took place over 8 years ago. Many of the new categories in SOC2000 may now be populated quite differently. Furthermore, the process of reclassifying data is different from the process of coding. The former involves much expert judgement and discussion. The latter must be a routine process that, by its nature, is error prone.

Figures 7 and 8 show the occupational structure of employment in England and Wales in 1991, classified to the major group structure of SOC90 and SOC2000. These bar charts reveal the *net* effect of the change in classification structure mask the fact that a significant number of large and offsetting changes underlie the differences shown. Nonetheless, it is at this aggregate level, or at the level of sub-major groups, that many users recognise and use the Standard Occupational Classification.

There are a number of areas where the move to SOC2000 will have a significant impact upon our view of the occupational structure of employment. In major group 1 (*Managers and Senior Officials*) the tightening of the definition of managers reduces the size of this category significantly, especially for females (4 per cent reduction for females and 2 per cent reduction for males). Major group 3 (*Associate Professionals and Technicians*) increases in size, more so for men than for women. Major group 4 (*Administrative, Clerical and Secretarial Occupations*) declines

significantly for males and slightly for females. Major group 6 (*Personal Service Occupations*) declines sharply for males, by almost three-quarters, and by about a quarter for females. The shift of waiters, waitresses and bar staff to major group 9 (*Elementary Occupations*) has a marked effect upon the size of this major group, which rises from 8 per cent of male employment to over 12 per cent and from 9 per cent of female employment to over 16 per cent.

Figure 7: Occupational structure of male employment, England and Wales, 1991: a comparison of SOC90 and SOC2000

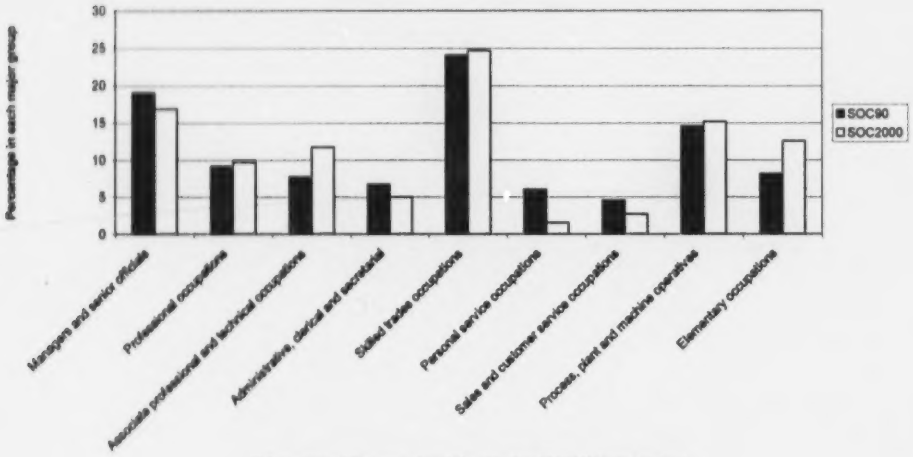
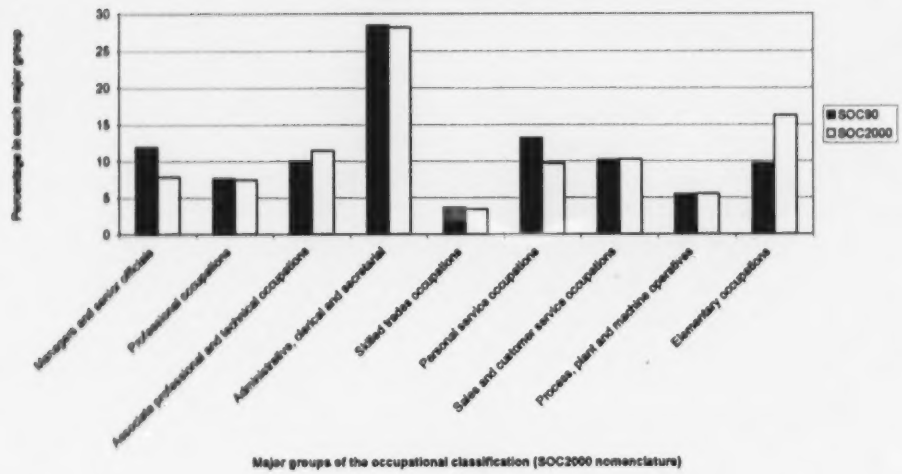


Figure 8: Occupational structure of female employment, England and Wales, 1991: a comparison of SOC90 and SOC2000



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8. Conclusions

SOC2000 has a somewhat grandiose title, associated with and perhaps suggestive of preparation for changes in the new Millennium. This it certainly is not. Like any standard classification it must adapt to and seek to incorporate change within its structure. If this did not happen, users would modify it themselves on an *ad hoc* basis and the standard would gradually disappear. But continual adaptation of a standard classification would defeat one of the main purposes of classification, the measurement and monitoring of change. With the need for this balance between change and continuity in mind, UK government departments decided upon a ten-year lifetime for the 1990 Standard Classification of Occupations. The work described in this paper reflects this decision. The process of revision was constrained by the need to preserve a degree of continuity with the previous classification, while simultaneously attempting to incorporate the significant changes in occupational definition which have taken place over the last decade. Some users will be critical of this work, especially those who look to see how the classification treats particular new and novel occupational titles. Harsher criticism may be directed at the treatment of particular occupational areas that are subject to continuing and rapid change, pointing out that the new classification is almost out of date as soon as it is published. In anticipation of such criticisms we can argue that our work represents an improvement on the previous classification. Rapid structural change, particularly in the area of communication technology, presents both statisticians and analysts with major measurement problems. Using the most up-to-date information available to us, we have attempted to take account of the changing nature of skill and work organisation and to incorporate these changes wherever possible within the revised classification

We can claim that the revised classification makes better use of its conceptual basis than was the case with SOC90. In this respect it is a better tool for the measurement of skill. At all its levels (major groups, sub-major groups, minor groups and unit groups) we believe that we have resolved a lot of problems which were inadequately dealt with in SOC90. These include the so-called 'manager' problem – the fact that major group 1 of SOC90 included a lot of administrative occupations by definition, together with the inclusion of a number of occupations that were simply wrongly allocated to this area. As such we have reduced the size of major group 1, but not sufficiently to bring the size of this occupational category in line with that recorded in other EU countries. This will serve to highlight the differences in the structure of occupations in the UK as opposed to the rest of Europe. We believe that SOC2000 will also have provided a better tool to the Employment Service for job-matching purposes. The classification needs of the Employment Service were not adequately determined when SOC90 was introduced. The move to a national standard in 1990 meant that some users had to compromise in terms of their needs for occupational information. This was particularly the case for the Employment Service. We trust that this situation has been improved considerably via the attention we have paid to the development of the classification in the wide range of occupations covered by the Employment Service.

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